

CLAIMS

- 1.** Raman amplifier comprising at least one optical fiber and at least 5 one pump laser, optically coupled to said optical fiber, said pump laser being adapted for emitting a pump radiation at a wavelength λ_p , wherein said optical fiber comprises a tellurite glass suitable for enhancing Raman effect, said glass comprising:
 - from 50% to 90%, in mole percentage of TeO_2 ;
 - 10 from 5% to 45% in mole percentage of a first metal oxide of an element selected from the group consisting of : Nb, W, Ti, Tl, Ta, and Mo;
 - from 5% to 30% in mole percentage of a second different metal oxide of an element selected from the group consisting of : Nb, W, Ti, Pb, Sb, In, Bi, Tl, Ta, Mo, Zr, Hf Cd, Gd, La, Ba.
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- 2.** Raman amplifier according to claim 1, wherein the mole percentage of TeO_2 in said glass is from 65% to 85%.
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- 3.** Raman amplifier according to claim 1, wherein the mole percentage of said first metal oxide is from 5% to 30%.
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- 4.** Raman amplifier according to claim 1, wherein the mole percentage of said first metal oxide is from 10% to 25%.
- 5.** Raman amplifier according to claim 1, wherein the mole percentage of said second metal oxide is from 5% to 20%.
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- 6.** Raman amplifier according to claim 1, wherein said tellurite glass further comprise an oxide of a metal selected from the group consisting of Y, Sc, Al, Ga, Ge, P, Li, Na, K, Rb, Cs, Mg, Ca, Sr, Be, B, Zn.
- 7.** Raman amplifier according to claim 1, wherein said first oxide is an oxide of an element selected from the group consisting of Nb, W and Ti.

8. Raman amplifier according to claim 1 or 7, wherein said second oxide is an oxide of an element selected from the group consisting of Nb, W and Ti.

5 **9. Raman amplifier according to claim 1, wherein said tellurite glass comprises from 50% to 90% in mole percentage of TeO₂, from 5% to 30% in mole percentage of niobium oxide and from 5% to 30% in mole percentage of tungsten oxide.**

10 **10. Raman amplifier comprising at least one optical fiber and at least one pump laser, optically coupled to said optical fiber, said pump laser being adapted for emitting a pump radiation at a wavelength λ_p , characterized in that said optical fiber comprises a tellurite glass suitable for enhancing Raman effect, said glass comprising:**

15 from 55% to 95% in mole percentage of TeO₂;
from 5% to 45% in mole percentage of a metal oxide of an element selected from the group consisting of : Nb, Ti, Tl, Ta, and Mo.

20 **11. Raman amplifier according to claim 10, wherein said tellurite glass comprises from 65% to 95% in mole percentage of TeO₂.**

12. Raman amplifier according to claim 10, wherein said tellurite glass comprises from 5% to 35% in mole percentage of said metal oxide.

25 **13. Optical telecommunication link including an optical fiber path for transmitting an optical signal and at least a Raman amplifier as defined according to any of the preceding claims, optically coupled along said optical fiber path.**

30 **14. Optical fiber for Raman amplification comprising a glass composition which comprises:**
from 50% to 90% in mole percentage of TeO₂;
from 5% to 45% in mole percentage of a first metal oxide of an element selected from the group consisting of : Nb, W, Ti, Tl, Ta, and Mo;

from 5% to 30% in mole percentage of a second different metal oxide of an element selected from the group consisting of : Nb, W, Ti, Pb, Sb, In, Bi, Tl, Ta, Mo, Zr, Hf Cd, Gd, La, Ba; said composition being substantially free of erbium.

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15. Optical fiber according to claim 14 wherein said first oxide is an oxide of an element selected from the group consisting of Nb, W and Ti.

10 **16.** Optical fiber according to claim 14 or 15 wherein said second oxide is an oxide of an element selected from the group consisting of Nb, W and Ti.

15 **17.** Optical fiber according to claim 14 wherein said glass comprises from 50% to 90% in mole percentage of TeO_2 , from 5% to 30% in mole percentage of niobium oxide and from 5% to 30% in mole percentage of tungsten oxide.

18. Optical fiber for Raman amplification comprising a glass composition which comprises:

20 from 55% to 95% in mole percentage of TeO_2 ;
from 5% to 45% in mole percentage of a metal oxide of an element selected from the group consisting of : Nb, Ti, Tl, Ta, and Mo;
said composition being substantially free of erbium.

25 **19.** Optical fiber according to any of the preceding claims 14 to 18, wherein said glass composition has a thermal stability index Tx-Tg higher than 125°C.

30 **20.** Optical fiber according to claim 19 wherein said thermal stability index Tx-Tg is higher than 150°C.

21. Optical fiber according to claim 19 wherein said thermal stability index Tx-Tg is higher than 160°C.

22. Optical fiber according to any of the claims 14 to 21 wherein said glass composition shows a maximum Raman gain higher than 100 times with respect to pure silica glass.

5 **23.** Optical fiber according to claim 22, wherein said glass composition shows a maximum Raman gain higher than 120 times with respect to pure silica glass.

10 **24.** Optical fiber according to any of the claims 14 to 23 the total cross-section of the Raman emission spectrum of said glass composition in the frequency shift range of from 200 cm^{-1} to 1080 cm^{-1} is at least 100 times greater with respect to the total cross-section of the Raman emission of pure silica in the same frequency shift range.

15 **25.** Optical fiber according claim 23 wherein said total cross-section of the Raman emission spectrum of said glass composition at least 120 times greater with respect to the total cross-section of the Raman emission of pure silica in the same frequency shift range.

20 **26.** Optical fiber according claim 24 wherein said total cross-section of the Raman emission spectrum of said glass composition at least 150 times greater with respect to the total cross-section of the Raman emission of pure silica in the same frequency shift range.

25 **27.** Optical fiber according to any of the preceding claims 14 to 26, comprising a core portion and a cladding portion, wherein at least said core portion is made from a tellurite glass as defined in any of said claims 14 to 26.

30 **28.** Method for increasing at least one of the parameters selected among Raman bandwidth broadening and thermal stability of a binary glass composition including tellurium oxide and a first metal oxide of an element selected among Nb, W, Ti, Tl, Ta, and Mo which comprises preparing a ternary glass composition comprising said tellurium oxide, said first metal oxide and a predetermined amount of a second different

metal oxide of an element selected among Nb, W, Ti, Pb, Sb, In, Bi, Tl, Ta, Mo, Zr, Hf Cd, Gd, La, Ba.